

WHAT IS CLAIMED IS:

1. A method for enabling in-network location based services, comprising:
 - (a) receiving, in a location server on a wireless network, trigger information, for one or more triggers, from a location based application located outside of the wireless network, wherein the trigger information defines:
 - (i) a source locatable that specifies an object of interest;
 - (ii) spatial information that defines spatial criteria for a target locatable that will activate the trigger;
 - (iii) a notification flag that describes an interaction between the source locatable and the spatial criteria that will cause an alert; and
 - (iii) temporal information that defines a time period for which the trigger will be active;
 - (b) determining if the one or more triggers are active based on the temporal information;
 - (c) obtaining an updated location of the target locatable if the trigger is active;
 - (d) evaluating the active triggers by determining if a trigger alert has been caused by the source locatable interacting with the target locatable in accordance with the spatial information and notification flag; and
 - (e) pushing a location answer to the location based application if a trigger alert has been caused.

2. The method of claim 1, wherein:

the source locatable comprises a mobile source locatable that defines a location described by an identifier of a mobile device; and

the evaluating further comprises retrieving an updated location of the mobile source locatable.

5

3. The method of claim 1, wherein the locatable comprises a fixed source locatable that is defined by a coordinate pair.

4. The method of claim 1, wherein the spatial information comprises a start stop filter that detects if the target locatable has started or stopped moving.

10

5. The method of claim 1, wherein the spatial information comprises a buffered locatable filter that describes a buffer around the target locatable.

6. The method of claim 1, wherein the temporal information comprises an active temporal filter that defines a period of time that starts now and ends at a defined time.

15

7. The method of claim 1, wherein the temporal information comprises a scheduled temporal filter that defines a fixed period of time.

20

8. The method of claim 1, further comprising storing the trigger in a persistent datastore.

9. The method of claim 8, wherein the persistent datastore is temporally indexed.

5 10. The method of claim 1, wherein determining if the trigger is active is further based on spatial information comprising:

obtaining a location area for the target locatable from a passive database;

comparing the location area to a location area index for the trigger; and

filtering out triggers if the location area is not within the location area index.

10

11. The method of claim 1, further comprising adding active triggers to an in-memory trigger cache.

12. The method of claim 1, further comprising storing the updated location
15 in a spatially indexed cache that provides the ability to filter out target locatables that are not in proximity to the source locatable as specified in the spatial information.

13. The method of claim 1, wherein obtaining the updated location
comprises estimating the updated location of the target locatable using a previous
20 location of the target locatable, a timestamp of the previous location, and a velocity estimated from successive locations.

14. The method of claim 13, further comprising storing a location

hypercube instance for the target locatable comprising:

- a coordinate pair identifying the location of the target locatable;
- a time stamp at which the coordinate pair was recorded; and
- an estimated velocity of the target locatable.

5

15. The method of claim 1, wherein obtaining the updated location comprises estimating the updated location of the target locatable using a profile and history of the target locatable.

10 16. The method of claim 1, wherein a frequency of obtaining the updated location is based on a spatial relationship between the source locatable and target locatable.

15 17. A system for enabling in-network location based services in a computer system comprising:
(a) a persistent datastore communicatively coupled to a location server;
(b) trigger information stored in the persistent datastore, wherein the trigger information defines:

- (i) a source locatable that specifies an object of interest;
- 20 (ii) spatial information that defines spatial criteria for a target locatable that will activate the trigger;
- (iii) a notification flag that describes an interaction between the source locatable and the spatial criteria that will cause an alert; and

(iii) temporal information that defines a time period for which the trigger will be active;

(c) a location server on a wireless network, wherein the location server is configured to:

5 (i) receive trigger information for one or more triggers from a location based application located outside of the wireless network;

(ii) determine if the one or more triggers are active based on the temporal information;

10 (iii) obtain an updated location of the target locatable if the trigger is active;

(iv) evaluate the active triggers by determining if a trigger alert has been caused by the source locatable interacting with the target locatable in accordance with the spatial information and notification flag; and

15 (v) push a location answer to the location based application if a trigger alert has been caused.

18. The system of claim 17, wherein:

the source locatable comprises a mobile locatable that defines a location described by an identifier of a mobile device; and

20 the location server is further configured to evaluate the active triggers by retrieving an updated location of the mobile locatable.

19. The system of claim 17, wherein the source locatable comprises a

fixed locatable that is defined by a coordinate pair.

20. The system of claim 17, wherein the spatial information comprises a start stop filter that detects if the target locatable has started or stopped moving.

5

21. The system of claim 17, wherein the spatial information comprises a buffered locatable filter that describes a buffer around the target locatable.

22. The system of claim 17, wherein the temporal information comprises
10 an active temporal filter that defines a period of time that starts now and ends at a defined time.

23. The system of claim 17, wherein the temporal information comprises a scheduled temporal filter that defines a fixed period of time.

15

24. The system of claim 17 wherein the persistent datastore is temporally indexed.

25. The system of claim 17, wherein the location server is further
20 configured to determine if the trigger is active based on spatial information by:
obtaining a location area for the target locatable from a passive database;
comparing the location area to a location area index for the trigger; and
filtering out triggers if the location area is not within the location area index.

26. The system of claim 17, wherein the location server is further configured to add active triggers to an in-memory trigger cache.

5 27. The system of claim 17, wherein the location server is further configured to store the updated location in a spatially indexed cache that provides the ability to filter out target locatables that are not in proximity to the source locatable as specified in the spatial information.

10 28. The system of claim 17, wherein the location server is configured to obtain the updated location by estimating the updated location of the target locatable using a previous location of the target locatable, a timestamp of the previous location, and a velocity estimated from successive locations.

15 29. The system of claim 28, wherein the location server is further configured to store a location hypercube instance for the target locatable, wherein the location hypercube comprises:

 a coordinate pair identifying the location of the target locatable;

 a time stamp at which the coordinate pair was recorded; and

20 an estimated velocity of the target locatable.

 30. The system of claim 17, wherein the location server is configured to obtain the updated location by estimating the updated location of the target locatable

using a profile and history of the target locatable.

31. The system of claim 17, wherein the location server obtains the updated location at a frequency that is based on a spatial relationship between the
- 5 source locatable and target locatable.